

THAT WHICH IS CLAIMED IS:

1. A millimeter wave (MMW) transceiver module comprising:
  - a circuit board; and
  - a microwave monolithic integrated circuit (MMIC) transceiver chip set that is surface mounted on the circuit board, said MMIC transceiver chip set further comprising,
    - a receiver MMIC chip package, a transmitter MMIC chip package and a local oscillator (LO) multiplier MMIC chip package that are each surface mounted on the circuit board and operatively connected to each other for millimeter wave transceiver operation, each MMIC chip package including
      - a base;
      - a multilayer substrate board formed from layers of low temperature transfer tape and received on said base plate, said multilayer substrate board having at least three layers and carrying RF signals, DC signals, grounding, and embedded passive components including resistors and capacitors; and
      - at least one MMIC chip received on the multilayer substrate.
2. A millimeter wave (MMW) transceiver module according to Claim 1, and further comprising a filter formed on the multilayer substrate board and operatively connected to said MMIC chip.
3. A millimeter wave (MMW) transceiver module according to Claim 2, wherein said filter formed on the multilayer substrate board comprises vertically stacked resonators in the multilayer substrate board.

4. A millimeter wave (MMW) transceiver module according to Claim 3, wherein said filter comprises a plurality of coupled line millimeter wavelength resonators formed as stripline or microstrip  
5 and positioned on an outer filter surface defined on the multilayer substrate board, radio frequency contacts, and conductive vias extending through the multilayer substrate board.

5. A millimeter wave (MMW) transceiver module according to Claim 2, wherein said filter further comprises a plurality of isolation vias extending through said multilayer substrate board.

6. A millimeter wave (MMW) transceiver module according to Claim 1, wherein said base comprises an alumina plate that is metal plated.

7. A millimeter wave (MMW) transceiver module according to Claim 1, and further comprising a heat sink vias formed within the base.

8. A millimeter wave (MMW) transceiver module according to Claim 1, wherein said multilayer substrate board further comprises a substrate on which low temperature transfer tape layers are mounted.

9. A millimeter wave (MMW) transceiver module according to Claim 1, wherein each layer of low temperature transfer tape is about 3 mil thick.

10. A millimeter wave (MMW) transceiver module according to Claim 1, wherein a top layer of the multilayer substrate board has chip cutouts for receiving MMIC chips therein.

11. A millimeter wave (MMW) transceiver module according to Claim 1, said multilayer substrate board comprises a plurality of interconnects and interconnects vias positioned within low temperature transfer tape layers forming the substrate board.

12. A millimeter wave (MMW) transceiver module according to Claim 1, wherein said receiver MMIC chip package comprises a low noise amplifier, a mixer and an image reject filter.

13. A millimeter wave (MMW) transceiver module according to Claim 1, wherein said transmitter MMIC chip package comprises a power amplifier, mixer and a local oscillator signal reject filter.

14. A millimeter wave (MMW) transceiver module according to Claim 1, wherein said local oscillator multiplier MMIC chip package comprises an x-band mixer, amplifier and a filter for filtering any fundamental frequency.

15. A microwave monolithic integrated circuit (MMIC) transceiver chip set for surface mounting on a circuit board and forming a millimeter wave (MMW) transceiver module comprising:

5 a receiver MMIC chip package, a transmitter MMIC chip package and a local oscillator (LO) multiplier MMIC chip package, each MMIC chip package comprising,

a base;

10 a multilayer substrate board formed from layers of low temperature transfer tape and received on said base, said multilayer substrate board having at least three layers

and carrying RF signals, DC signals,  
15 grounding, and embedded passive components  
including resistors and capacitors;  
at least one MMIC chip received on the  
multilayer substrate;  
said receiver MMIC chip package including a  
20 low noise amplifier, a mixer and image reject filter;  
said transmitter MMIC chip package including  
a mixer, power amplifier and local oscillator signal  
reject filter; and  
said local oscillator multiplier MMIC chip  
25 package including an amplifier, mixer, feedback loop  
circuit and filter for filtering any fundamental  
frequency.

16. A microwave monolithic integrated  
circuit (MMIC) transceiver chip set according to  
Claim 15, wherein each of said filters for each chip  
package further comprise isolation vias extending  
5 through the multilayer substrate board.

17. A microwave monolithic integrated  
circuit (MMIC) transceiver chip set according to  
Claim 15, wherein said base comprises an alumina base  
that is metal plated.

18. A microwave monolithic integrated  
circuit (MMIC) transceiver chip set according to  
Claim 15, wherein a top layer of the multilayer  
substrate board has chip cutouts for receiving MMIC  
5 chips therein.

19. A microwave monolithic integrated  
circuit (MMIC) transceiver chip set according to  
Claim 15, wherein said multilayer substrate board

comprises a plurality of interconnects and interconnect  
5 vias positioned within the low temperature transfer  
tape layers forming the multilayer substrate board.

20. A method of forming a millimeter wave  
(MMW) transceiver module comprising the step of:

surface mounting on a circuit board a  
receiver MMIC chip package, a transmitter MMIC chip  
5 package and a local oscillator (LO) multiplier MMIC  
chip package, each chip package comprising,  
a base;  
a multilayer substrate board formed from  
layers of low temperature transfer tape and  
10 received on said base plate, said multilayer  
substrate board having at least three layers  
and carrying RF signals, DC signals,  
grounding, and embedded passive components  
including resistors and capacitors;  
15 at least one MMIC chip received on the  
multilayer substrate;  
said receiver MMIC chip package including a  
low noise amplifier, a mixer and image reject filter;  
said transmitter MMIC chip package including  
20 a mixer, power amplifier and local oscillator signal  
reject filter; and  
said local oscillator multiplier MMIC chip  
package including an amplifier, mixer, feedback loop  
circuit and filter for filtering any fundamental  
25 frequency.